

**REMARKS**

The forgoing amendment amends claims 1, 9, 13, 22 and 27 and cancels claim 21. Now pending in the application are claims 1-20 and 22-27, of which claims 1, 9, 13 and 27 are independent.

**I. Claim Amendments**

Claims 1, 9, 13 and 27 are amended to clarify that the component is an interconnector component for an electrochemical converter. Claim 22 is amended to depend from claim 13. Support for the amendment can be found in the original claims and specification of the present application. No new matter is added.

**II. Summary of Rejections**

Claims 1, 2, 4, 6, 13-17, 21-23 and 25-27 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,290,642 (“Minh-I”).

Claims 1, 4, 5, 13-17, 21-23 and 25-27 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,256,499.

Claims 1, 13, 16, 21, 22 and 27 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,171,645.

Claims 13-15, 17, 19, 21, 23, 25 and 27 are rejected under 35 U.S.C. §102(b) as being anticipated by JP 5-101838.

Claims 13-15 and 18-20 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,898,008.

Claims 1 and 16 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent Application Publication No. 2005/0019636 (“Kwon”).

Claims 2, 3 and 24 are rejected under 35 U.S.C. §103(a) as being unpatentable over Minh-I in view of U.S. Patent Application Publication No. 2002/0081475.

Claim 7 is rejected under 35 U.S.C. §103(a) as being unpatentable over Minh-I in view of U.S. Patent Application Publication No. 2004/0017028.

Claim 14 is rejected under 35 U.S.C. §103(a) as being unpatentable over Minh-I in view of U.S. Patent No. 4,913,982.

Claims 1 and 8 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,882,809 in view of either Minh *et al.* or Kwon.

Claims 9-12 are rejected under 35 U.S.C. §103(a) as being unpatentable over Minh-I in view of JP 9-190829.

Claims 21, 23, 25 and 26 are rejected under 35 U.S.C. §102(e) as being anticipated by or, in the alternative, under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,843,960.

The rejection will be discussed separately.

### **III. Rejections of Claims 1, 2, 4, 6, 13-17, 21-23 and 25-27**

Claims 1, 2, 4, 6, 13-17, 21-23 and 25-27 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,290,642 (Minh-I”).

Independent claim 1 relates to a method of forming an interconnector component for an electrochemical converter. The method performs tape casting a slurry material into a sheet. In the claimed invention, the sheet or tape is hot pressed *using a combination of heat and pressure* to form the interconnector component. As described in the specification of the present application, the suitable temperature and pressure may be in the range of about 1300°C and 1000

psi, respectively. Independent claims 13 and 27 also include the feature of applying heat and pressure to sinter a sheet.

Applicants submit that Minh-I does not disclose “hot pressing the laminated structure using a combination of heat and pressure to form a sintered structure,” as recited in claim 1, and “applying heat and pressure to sinter the sheet,” as recited in claims 13 and 27.

Minh-I discloses a method of fabricating a monolithic solid oxide fuel cell. Minh-I discloses tape casting and heat processing using *only* heat. (See Minh-I, column 6, lines 9-66, and column 7, lines 31-56). Minh-I, however, does not disclose using the combination of heat and pressure to form the interconnector component for an electrochemical converter.

In view of the foregoing arguments, Applicants submit that Minh-I does not disclose each and every element of claims 1, 13 and 27. Applicants therefore request withdrawal of the rejection of claims 1, 2, 4, 6, 13-17, 21-23 and 25-27.

#### **IV. Rejections of Claims 1, 4, 5, 13-17, 21-23 and 25-27**

Claims 1, 4, 5, 13-17, 21-23 and 25-27 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,256,499 (Minh-II”).

Applicants submit that Minh-I does not disclose “hot pressing the laminated structure using a combination of heat and pressure to form the interconnector component,” as recited in claim 1, and “applying heat and pressure to sinter the sheet,” as recited in claims 13 and 27.

Minh-II discloses a method of fabricating a monolithic solid oxide fuel cell with integral manifolds. Minh-II discloses tape casting and partial heat processing using *only* heat. (See Minh-II, column 5, line 28 through column 6, line 15, and column 7, lines 18-46). Minh-II does not disclose using the combination of heat and pressure to form the interconnector component for an electrochemical converter.

In view of the foregoing arguments, Applicants submit that Minh-II does not disclose each and every element of claims 1, 13 and 27. Applicants therefore request withdrawal of the rejection of claims 1, 4, 5, 13-17, 21-23 and 25-27.

**V. Rejections of Claims 1, 13, 16, 21, 22 and 27**

Claims 1, 13, 16, 21, 22 and 27 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,171,645 (“Khandkar”).

Applicants submit that Khandkar does not disclose “hot pressing the laminated structure using a combination of heat and pressure to form the interconnector component,” as recited in claim 1, and “applying heat and pressure to sinter the sheet,” as recited in claims 13 and 27.

Khandkar discloses a zirconia-bismuth oxide graded electrolyte. Khandkar discloses tape casting and sintering process using *only* heat. (See Khandkar, column 5, lines 1-8). Khandkar however, does not disclose using the combination of heat and pressure to form the interconnector component for an electrochemical converter.

In view of the foregoing arguments, Applicants submit that Khandkar does not disclose each and every element of claims 1, 13 and 27. Applicants therefore request withdrawal of the rejection of claims 1, 13, 16, 21, 22 and 27.

**VI. Rejections of Claims 13-15, 17, 19, 21, 23, 25 and 27**

Claims 13-15, 17, 19, 21, 23, 25 and 27 are rejected under 35 U.S.C. §102(b) as being anticipated by JP 5-101838.

Applicants submit that JP 5-101838 does not disclose “applying heat and pressure to sinter the sheet,” as recited in claims 13 and 27.

JP 5-101838 discloses a method for manufacturing an interconnector. JP 5-101838 discloses sintering at 1400-1600 degrees, and then flattening by applying a weight. JP 5-

101838, however, does not disclose applying both heat and pressure to sinter the sheet or tape, as recited in claim 13 and 27.

In view of the foregoing arguments, Applicants submit that Khandkar does not disclose each and every element of claims 13 and 27. Applicants therefore request withdrawal of the rejection of claims 13-15, 17, 19, 21, 23, 25 and 27.

**VII. Rejections of Claims 13-15 and 18-20**

Claims 13-15 and 18-20 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,898,008 (“Kolker”).

Applicants submit that Kolker does not disclose “casting a slurry material into a sheet to form the interconnector component,” as recited in claim 13.

Kolker disclose a pore-free sintered body on the basis of silicon carbide. Kolker disclose a sintered body for a hard disk. Kolker, however, does not disclose a sintered body for an interconnector component of an electrochemical converter, as recited in claim 13.

In view of the foregoing arguments, Applicants submit that Khandkar does not disclose each and every element of claim 13. Applicants therefore request withdrawal of the rejection of claims 13-15 and 18-20.

**VIII. Rejections of Claims 1 and 16**

Claims 1 and 16 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent Application Publication No. 2005/0019636 (“Kwon”).

Applicants submit that Kwon does not qualify as prior art to reject the present application 35 U.S.C. §102(b) because Kwon was published after the filing date of the present application. Applicants, however, provide the following comments regarding the cited reference.

Claims 1 and 13 are directed to a method of forming an interconnector component for an electrochemical converter. With the method, the claimed invention may form the sintered structure of an interconnector component that is ultra dense and thin, and has high oxidation and corrosion resistance, high electrical and thermal conductivity, hydrogen reduction stability, and low thermal expansion.

In comparison, Kown discloses a method for forming an electrolyte (304) adjacent to an anode (302) on one side and a cathode (306) on another side. (See Kown, paragraphs [0038]-[0040]). Kown, however, does not disclose forming an interconnector component.

In view of the foregoing arguments, Applicants submit that Kwon does not disclose each and every element of claims 1 and 13. Applicants therefore request withdrawal of the rejection of claims 1 and 16.

#### **IX. Rejections of Claims 2, 3 and 24**

Claims 2, 3 and 24 are rejected under 35 U.S.C. §103(a) as being unpatentable over Minh-I in view of U.S. Patent Application Publication No. 2002/0081475 (“Simpkins”).

Claims 2 and 3 depend upon claim 1 and add separate and patentable limitations. Claim 24 depends upon claim 13 and adds a separate and patentable limitation. Simpkins is cited by the Examiner to provide teachings for the limitation added in claims 2, 3 and 24.

Applicants submit that Simpkins does not teach “hot pressing the laminated structure using a combination of heat and pressure to form a sintered structure,” as recited in claim 1, and “applying heat and pressure to sinter the sheet,” as recited in claim 13. Simpkins teaches a gas diffusion mat for fuel cells. Simpkins, however, does not teach the use of heat and pressure together to form the sintered structure of a sheet or tape.

In view of the foregoing arguments, Applicants submit that Minh-I and Simpkins do not teach all of the limitations of claims 1 and 13. Claims 2, 3 and 24, which depend from one of

claims 1 and 13, are not rendered obvious over the cited references. Applicants therefore request withdrawal of the rejection of claims 2, 3 and 24.

#### **X. Rejection of Claim 7**

Claim 7 is rejected under 35 U.S.C. §103(a) as being unpatentable over Minh-I in view of U.S. Patent Application Publication No. 2004/0017028 (“Olsen”).

Claim 7 depends upon claim 1 and adds a separate and patentable limitation. Olsen is cited by the Examiner to provide teachings for the limitation added in claim 7.

Applicants submit that Olsen does not teach “hot pressing the laminated structure using a combination of heat and pressure to form a sintered structure,” as recited in claim 1. Olsen teaches shaping solid oxide fuel cells (SOFC) and SOFC stacks. Olsen, however, does not teach the use of heat and pressure together to form the sintered structure of a sheet or tape.

In view of the foregoing arguments, Applicants submit that Minh-I and Olsen do not teach all of the limitations of claim 1. Claim 7, which depends from claim 1, is not rendered obvious over the cited references. Applicants therefore request withdrawal of the rejection of claim 7.

#### **XI. Rejections of Claim 14**

Claim 14 is rejected under 35 U.S.C. §103(a) as being unpatentable over Minh-I in view of U.S. Patent No. 4,913,982 (“Kotchick”).

Claim 14 depends upon claim 13 and adds a separate and patentable limitation. Kotchick is cited by the Examiner to provide teachings for the limitation added in claim 14.

Applicants submit that Olsen does not teach “applying heat and pressure to sinter the sheet,” as recited in claim 13. Kotchick teaches a method for fabricating a monolithic solid

oxide fuel cell. Kotchick, however, does not teach the use of heat and pressure to form the sintered structure of a sheet or tape.

In view of the foregoing arguments, Applicants submit that Minh-I and Kotchick do not teach all of the limitations of claim 13. Claim 14, which depends from claim 13, is not rendered obvious over the cited references. Applicants therefore request withdrawal of the rejection of claim 14.

## **XII. Rejections of Claims 1 and 8**

Claims 1 and 8 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,882,809 (“McPheeters”) in view of either Minh *et al.* or Kwon.

Applicants submit that McPheeters in view of either Minh *et al.* and Kwon do not teach “hot pressing the laminated structure using a combination of heat and pressure to form a sintered structure,” as recited in claim 1.

The Examiner recognizes that McPheeters does not teach this feature. (See Office Action, page 9). The Examiner alleges that Minh *et al.* teaches this feature. As discussed above in section III and IV, Minh-I and Min-II do not teach “hot pressing the laminated structure using a combination of heat and pressure to form a sintered structure,” as recited in claim 1.

The Examiner also alleges that Kwon teaches this feature. As discussed above in section VIII, Kwon does not teach using the hot pressing to form an interconnector component for an electrochemical converter.

In view of the foregoing arguments, Applicants submit that McPheeters, Minh *et al.* and Kwon do not teach all of the limitations of claim 1. Claim 8, which depends from claim 1, is not rendered obvious over the cited references. Applicants therefore request withdrawal of the rejection of claims 1 and 8.

## **XIII. Rejections of Claims 9-12**



Claims 9-12 are rejected under 35 U.S.C. §103(a) as being unpatentable over Minh-I in view of JP 9-190829.

Claim 9 is directed to an interconnector component for an electrochemical converter including a first layer and a second layer. The first layer includes a material having a composition that is at least 95% chromium. The second layer includes lanthanum chromite laminated to the first layer. The first layer and the second layer are hot pressed using a combination of heat and pressure to form the component.

Applicants submit that Minh-I and JP 9-190829 do not teach “an interconnector component for an electrochemical converter,” which includes a first layer of a material having a composition that is at least 95% chromium and a second layer of lanthanum chromite laminated to the first layer, as recited in claim 1.

Minh teaches interconnect material (33) sandwiched between anode material (30) and cathode material (32). The interconnect material (33) forms a single layer in Minh-I. Minh-I does not teach an interconnector component for an electrochemical converter” including a first layer of a material having a composition that is at least 95% chromium and a second layer of lanthanum chromite laminated to the first layer, as recited in claim 1.

JP 9-190829 teaches that the separator (20) is made of lanthanum chromite series ceramic, and the surface of the separator (20) facing the fuel gas passage is coated with a metal material layer (32) having a heat resistance and electroconductivity. JP 9-190829, however, does not teach the metal material layer (32) includes a material having a composition that is at least 95% chromium, as recited in claim 1.

Additionally, Applicants submit that Minh-I and JP 9-190829 do not teach “the first layer and the second layer are hot pressed using a combination of heat and pressure to form the component,” as recited in claim 9.

As discussed above in section III, Minh-I does not teach hot pressing using a combination of heat and pressure to form an interconnector component.

In JP 9-190829, the surface of the separator (20) is coated with a metal material layer (32) having a heat resistance and electrical conductivity. JP 9-190829, however, does not teach that the separator (20) and the metal material layer (32) are “hot pressed using a combination of heat and pressure to form the component,” as recited in claim 9.

In view of the foregoing arguments, Applicants submit that Minh-I and JP 9-190829 do not teach all of the limitations of claim 9. Claims 10-12, which depends from claim 9, are not rendered obvious over the cited references. Applicants therefore request withdrawal of the rejection of claims 9-12.

#### **XIV. Rejections of Claims 21, 23, 25 and 26**

Claims 21, 23, 25 and 26 are rejected under 35 U.S.C. §102(e) as being anticipated by or, in the alternative, under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,843,960 (“Krumpelt”).

Claim 21 is canceled. Claims 23, 25 and 26 depend upon claim 13 and add separate and patentable limitations. Applicants submit that Krumpelt does not disclose or teach “applying heat and pressure to sinter the sheet,” as recited in claim 13. Krumpelt disclose or teach interconnects for solid oxide fuel cells. Krumpelt, however, does not teach that the interconnects are formed by applying heat and pressure to sinter the sheet, as recited in claim 13.

Claims 23, 25 and 26 recite an interconnector plate formed by the method of claim 13. The Examiner notes that “[i]n the event any differences can be shown for the product of the product-by-process claims, as opposed to the product taught by the reference, such differences would have been obvious to one of ordinary skill in the art as a routine modification of the product in the absence of a showing of unexpected results.” Applicants submit that interconnector plate formed by the method of claim 13 has unexpected results of sintered structure being ultra dense and thin, and having high oxidation and corrosion resistance, high

electrical and thermal conductivity, hydrogen reduction stability, and low thermal expansion.  
(See the present application, pages 2 and 9).

In view of the foregoing arguments, Applicants submit that the interconnector plates of claims 23, 25 and 26 are not obvious over the interconnects of Krumpelt. Applicants therefore request withdrawal of the rejection of claims 21, 23, 25 and 26.

#### **XV. Conclusion**

In view of the above amendment, applicant believes the pending application is in condition for allowance.

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